Claims

1. A thermoelectric-conversion element comprising:

an n-type member which includes a conductive tubular member having a channel in it and an n-type semiconductive layer formed on the outside of the conductive tubular member;

a p-type member which includes a conductive tubular member having a channel in it and a p-type semiconductive layer formed on the outside of the conductive tubular member; and

a connector which electrically connects the conductive tubular member of the n-type member and the conductive tubular member of the p-type member.

2. A thermoelectric-conversion module comprising a plurality of thermoelectric-conversion elements according to claim 1 connected in series, the n-type and p-type semiconductive layers of each thermoelectric-conversion element being connected to the p-type semiconductive layer of another thermoelectric-conversion element and the n-type semiconductive layer of yet another thermoelectric-conversion element, respectively.

3. A thermoelectric-conversion element comprising:

an n-type member which includes a conductive tubular member having a channel in it and an n-type semiconductive layer formed on the outside of the conductive tubular member;

a p-type member which includes a conductive tubular member having a channel in it and a p-type semiconductive layer formed on the outside of the conductive tubular member; and

a connector which electrically connects the n-type semiconductive layer and the p-type semiconductive layer.

4. A thermoelectric-conversion module comprising a plurality of thermoelectric-conversion elements according to claim 3 connected in series, the conductive tubular member of the n-type member and the conductive tubular member of the p-type member of each thermoelectric-conversion element being connected to the conductive tubular member of the p-type member of another thermoelectric-conversion element and the conductive tubular member of the n-type member of yet another thermoelectric-conversion element, respectively.

5. The thermoelectric-conversion element according to claim 1, 2, 3, or 4, wherein a conductive layer is formed on each of the n-type and p-type semiconductive layers.

6. A thermoelectric-conversion element comprising:

a conductive tubular member having a channel in it;

an n-type semiconductive layer formed on one half of the outer surface of the conductive tubular member when the outer surface is divided into two along the longitudinal center axis of the conductive tubular member; and

a p-type semiconductive layer formed on the other half of the outer surface of the conductive tubular member,

the n-type and p-type semiconductive layers being connected by the conductive tubular member.

7. A thermoelectric-conversion module comprising a plurality of thermoelectric-conversion elements according to claim 6 connected in series, the n-type and p-type semiconductive layers of each thermoelectric-conversion element being connected to the p-type semiconductive layer of another thermoelectric-conversion element and the n-type semiconductive layer of yet another

thermoelectric-conversion element, respectively.

8. A method of manufacturing a thermoelectric-conversion element, comprising the steps of:

forming an n-type body including a conductive tubular member having a channel in it and an n-type semiconductive layer formed on the outside of the conductive tubular member and a p-type body including a conductive tubular member having a channel in it and a p-type semiconductive layer formed on the outside of the conductive tubular member;

sintering the n-type and p-type bodies; and

connecting the n-type and p-type bodies in series by a conductor.

9. The method according to claim 8, wherein a conductive layer is formed on the semiconductive layer of each of the sintered n-type and p-type bodies before the sintered n-type and p-type bodies are connected in series by the conductor.

10. The method according to claim 8 or 9, wherein each of the n-type and p-type bodies is formed by extruding a conductive tubular member and a fluid semiconductive material simultaneously from a single die.

11. The method according to claim 8 or 9, wherein each of the n-type and p-type bodies is formed by extruding a fluid conductive material and a fluid semiconductive material simultaneously from a single die.